5628

SPECIAL PAMPHLET *No. 36*

CONTROL OF GRASSHOPPERS IN THE PRAIRIE PROVINCES

The most troublesome grasshoppers of the prairies are the lesser migratory or stubble grasshopper, the clear-winged or roadside grasshopper, the two-striped grasshopper, Packard's grasshopper, and several species of range grasshoppers of which the big-headed grasshopper is the most injurious.

All injurious Prairie grasshoppers pass the winter in the egg stage. The eggs are found to a depth of 1½ inch below the ground surface and are packed together in pods which vary in size. For example, the lesser migratory grasshopper commonly lays up to 28 eggs in a pod but under very dry conditions the pods may contain as few as 2 to 3 eggs. The big-headed grasshopper averages about 7 eggs to a pod, while pods of the two-striped grasshopper commonly contain over 60 eggs. The eggs do not begin to hatch until the soil becomes warm, usually about the time the poplars come into leaf.

Some non-economic species of grasshoppers overwinter as partially grown nymphs. Their presence gives rise to frequent erroneous reports that the injurious grasshoppers are hatching, and to the hope that subsequent frosts will surely kill them.

Control

The key to success in any control campaign is whole-hearted co-operation on the part of everyone concerned.

The increase in numbers of grasshoppers is associated with periods of scanty rainfall and high temperature, and with cultivation and overgrazing. Hence modifications of tillage and grazing practices, to provide conditions less favourable for grasshopper survival and reproduction, are an essential part of control. With climate and local agricultural practices varying in different sections of the park-belt, open prairie, and range land, it is impossible to recommend practices which will be universally applicable. However, the following recommendations have been thoroughly tested and have proved successful in regions to which they are adapted. In applying these control methods one must also keep clearly in mind the type and severity of the infestation with which one is dealing. From the practical standpoint, the most important consideration is whether the grasshopper eggs occur throughout stubble fields, including lands intended for seeding, or whether they occur chiefly outside of crop land. In the latter case they may be concentrated in egg beds on the roadside, headlands, range land, or in weedy patches, drift soil, and along ditch banks.

Published by Authority of Honourable J. G. Gardiner, Minister of Agriculture, Ottawa, 1940.
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To be most effective and most economical of time and resources, the control program must include: (1) careful planning of the whole operation of the farm; (2) the sound use of tillage; (3) careful range management; and (4) the proper use of poisoned bait.

1. *Farm Planning*

Careful planning is essential to best control. *This is particularly important in the areas of open plains, where widespread infestations of the lesser migratory grasshopper are likely to be found.* The work should be so timed that summer-fallows will be completed before the grasshoppers migrate from the stubble to adjacent crops. As much as possible of the infested stubble land and recently abandoned land, which may be heavily infested, should be summer-fallowed and than by seeding a larger, improperly prepared acreage.
worked in a manner that will destroy the grasshoppers or their eggs and prevent migration. In severely infested areas it is folly to "stubble-in" any crop. Seed only summer-fallow and other fields which were worked the previous autumn or very early in the spring. By following this plan, a greater return will be assured than by seeding a larger, improperly prepared acreage.

2. *Tillage*

The proper use of tillage implements, particularly in areas infested by the lesser migratory grasshopper, greatly increases the possibility of effective control with only slight, if any, additional expense.

(*a*) *Mouldboard ploughing to a depth of 5 inches* is an excellent method of destroying grasshopper eggs, provided there is sufficient moisture to permit a good job of ploughing. It is best done in the autumn but may also be done in the early spring if the land is packed. This method is applicable in a large section of Manitoba and the park-belt, but in the open prairie there are areas where the mouldboard plough cannot be used and other areas where ploughing has given way to "ploughless cultivation." The disc plough is only partially effective.

(*b*) *Early fall tillage*, preferably behind the binder, prevents further egg-laying by grasshoppers.

(*c*) *Shallow cultivation of infested stubble* with the duck-foot cultivator, or single disc, has given excellent results in some districts. The most effective work is done with a single disc set to cut no deeper than 2 inches and drawn with a tractor at a speed of at least $4\frac{1}{2}$ miles per hour. This throws the soil and leaves many of the eggs on the surface, where they perish. The operation is more effective if done in the autumn and gives reasonable control of moderate infestations, but with severe infestations the treatment is well worth while as it reduces the infestation of the following summer. This practice is most effective in Alberta and western Saskatchewan, where the snowfall is light. It is sometimes of value in Manitoba, but cannot be depended upon.

(*d*) *Guard strips* of a black unseeded strip, a rod wide, around the outside of cropped fields will help to check invasion of young hoppers from summer-fallow and reverted fields until the hoppers can be killed with poisons. They are also of some value in protecting fields from invasion by a roadside infestation.

(*e*) *Summer-fallow.* Proper summer-fallowing is the most important cultural practice in controlling grasshopper outbreaks, particularly with the stubble type of infestation. Young grasshoppers migrating out of improperly worked summer-fallow may seriously damage adjacent crops. Since the grasshoppers on such fields can be poisoned readily without additional time or cost for tillage, handling summer-fallow as described below and illustrated in the accompanying diagram should be adopted as an annual practice in prairie districts.

DIAGRAM OF FIELD TO BE SUMMER-FALLOWED TAKEN FROM "GRASSHOPPER CONTROL IN SASKATCHEWAN", BULLETIN 87.

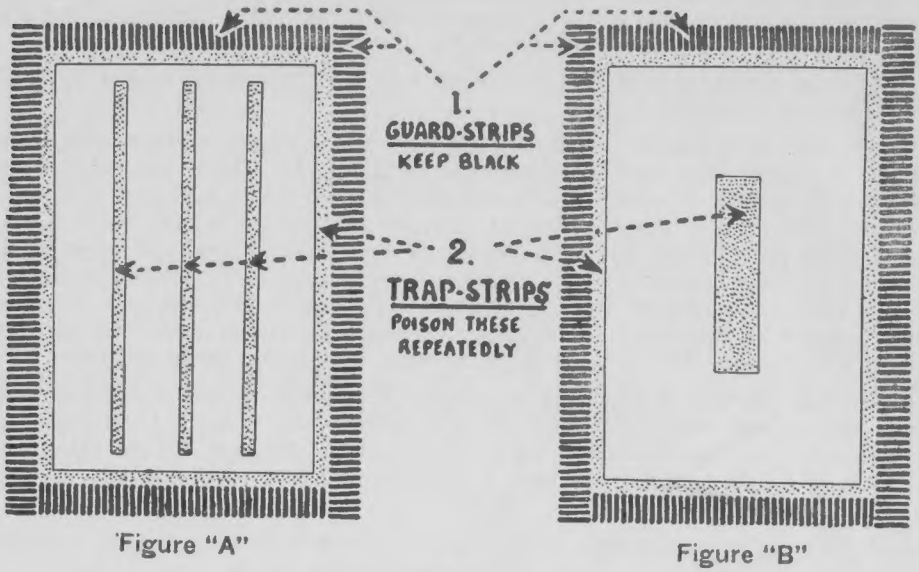

Diagram of Field to be Summer-fallowed

Illustrating essential features of how the plan for preventing migration of hoppers from summer-fallow to crop may be worked out. Figure "A" illustrates a field worked in lands. Figure "B" illustrates a field worked around and around, beginning at the outside.

Make a "black" guard strip not less than 3 rods wide around the outside of the field. Work down the remainder of the field in lands, leaving weedy trap strips in the centre of each land, where the young hoppers will gather for green food. If the field is not to be divided into lands but is worked as one piece from the outside toward the centre, one continuous trap strip should be left around the entire field, about 4 rods in from the margin. At least one more trap strip should be left in the centre of the field. In all cases the trap strips should be one to three rods wide, depending on the infestation. If these are too narrow, the hoppers may move off before they can be poisoned. Bait each trap strip promptly as the hoppers gather in it, and repeat whenever necessary. Under strip-farming conditions, the strips should be handled in a similar manner except that both guard and trap strips will be only about one rod in width.

3. *Range Management*

Any arrangement whereby portions of the range are kept free from stock during the growing period of the grasses, will have a beneficial and lasting effect on the range conditions. This will help greatly to restrict the grasshopper breeding grounds, which may then be kept under control by annual poisoning so that the grasshoppers are not allowed to reach injurious numbers.

4. *Baiting*

Poisoned bait, when properly used, is the most effective and practical means of killing both young and adult grasshoppers. It is the only means of controlling infestations in sod such as occur along roadsides, field margins, sloughs, pastures and open ranges, where cultural practices cannot be used. It should be used in field margins where grasshoppers are invading the crop, and to destroy concentrations of hoppers in trap strips. Poisoned bait is also effective in controlling general field infestations when used in conjunction with proper cultural methods.

Bait is distributed by the Provincial Departments of Agriculture in co-operation with the municipalities. The individual farmer, therefore, is not concerned with the bait formulae or instructions for mixing, which are given out to the mixing station operators. Formulae vary somewhat according to the area and species concerned and the availability of supplies.

In order to be most effective, poisoned bait must be spread according to the following directions:—

(*a*) *Spread bait at the right temperature.* Grasshoppers are not very active until the temperature reaches 65 degrees in the shade. They are most active between 75 and 90 degrees. The best kills are obtained if bait is spread when a rising temperature first reaches 68 degrees (in the shade) on calm, sunny days. One of the best guides is to watch the grasshoppers and spread bait as soon as they begin to feed. The moisture in the bait is very attractive, and if the bait is spread when they are not feeding it loses its attractiveness very quickly by drying out. Particularly good kills are secured when hoppers first start feeding after several days of cool, cloudy or rainy weather.

(*b*) *Spread bait thinly.* Do not exceed 20 pounds to the acre even where grasshoppers are very abundant in rank vegetation. Larger quantities are dangerous to stock, are wasteful, and decrease the efficiency. Five pounds to the acre gives very satisfactory results. *Bait should be spread only where grasshoppers are present.*

(*c*) *Spread bait by hand* on land that is too rough for a mechanical spreader and on small, isolated egg beds of the clear-winged grasshopper. Under such conditions hand spreading is considered very efficient, and even in infestations of larger areas no farmer should delay spreading to wait for a mechanical spreader.

(*d*) *Spread bait with mechanical spreaders* wherever they are available and the contour of the land and the absence of bush permit, and particularly where the infestation covers a large area. A perfectly working mechanical spreader will cover more ground with less bait than can be done by hand.

(*e*) *Spread bait as soon as hoppers begin to appear in numbers, to prevent crop loss.*

(*f*) *Continue to spread bait* throughout the summer whenever and wherever grasshoppers are present in numbers. This will reduce subsequent infestations as well as reduce immediate crop loss. This can be done to particular advantage with the clear-winged and two-striped grasshoppers when concentrated on egg beds on the roadsides and headlands, and with other species congregating in late green crops.

Much can be done to prevent a grasshopper outbreak by keeping close watch for any concentration of hoppers and poisoning them before they commence to cause damage, and by adopting as a regular practice those tillage operations which are known to reduce grasshopper populations.

Further information may be obtained by writing to the Dominion Entomological Laboratory, at Brandon, Man., Saskatoon, Sask., or Lethbridge, Alta.; or to the Provincial Department of Agriculture, at Winnipeg, Man., Regina, Sask., or Edmonton, Alta.

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Ottawa: Printed by J. O. Patenaude, I.S.O., Printer to the King's Most Excellent Majesty, 1940.